

MariFish Summaries

Working Collaboratively- Workshop on integrated ecosystem models; why, how and what to expect from them.

February 2011

Integrated ecosystem models

Integrated marine ecosystem models aim to provide a representation of the ecosystem that incorporates environmental, biological and human interactions. In recent years, these types of models have been developed to understand the marine ecosystem and have received growing attention from both scientists and marine ecosystem and fisheries managers. The reason for the increasing interest in these models is the recognition that a large diversity of drivers, from climate to internal biological interactions to humans, affects the ecosystem at a variety of spatial and temporal scales. Furthermore, these drivers act in a multiplicative way (figure 1) and it is therefore necessary to incorporate all of them in a common framework in order to forecast ecosystem state under given scenarios and to identify appropriate management measures to ensure that some target state is maintained. However, building integrated ecosystem models is far from simple and requires 1) a minimum balance between complexity, data and knowledge; and 2) an assessment of the model skills to achieve desired objectives.

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Under Work Package 7, MariFish arranged two coordinated workshops with the common objective of discussing the state-of-the-art and the future of integrated ecosystem modeling as a tool to investigate marine ecosystems and their use in fisheries management. The two coordinated workshops were:

1. WKIEM: MariFish -ICES Joint Workshop on Integrated ecosystem modelling; building our capacity to understand and manage marine ecosystems in a changing world – *lead by Miguel Bernal (IEO/CSIC)*.
2. WKMED: MariFish Workshop on Models for the Ecosystem Approach to Fisheries in the Mediterranean Sea – *lead by Cedric Bacher (IFREMER)*.

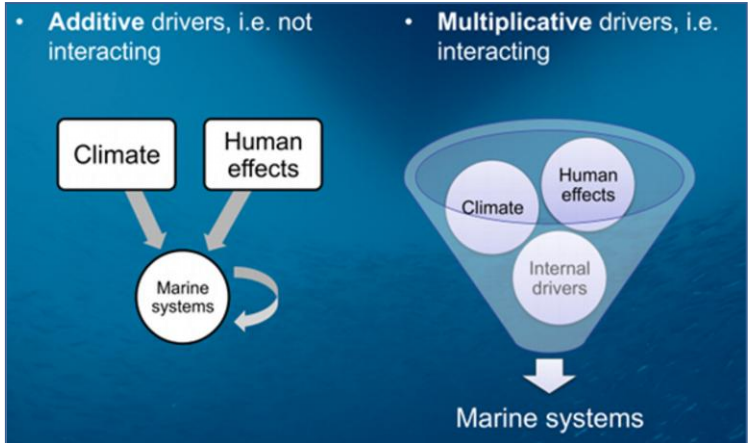


Figure 1: Additive versus multiplicative effects in the marine ecosystems (Source: Planque and Bernal ICES Theme session on combined climate and human effects, 2009).

Further information: Outcomes of the joint workshop, including the full reports, can be found on the MariFish webpage available at: <http://www.marifish.net/WP7/Workshops/default.htm>.



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Strengthening the links between European marine fisheries science and fisheries management



Main conclusions from the workshops:

- **Prominent strengths** of the use of integrated models to manage marine ecosystems include: synthesis of existing knowledge and data; possibility to formulate and test existing hypothesis; true interdisciplinary work; support in risk analysis and decision making; and capability of complex scenario analysis and integrated assessment (figure 2).
- **Potential problems** identified include: difficulties in coupling climate, physics and biology (selection of appropriate scales, large uncertainties in climate prediction specifically at coastal areas); the requirement that the different modules of the model need to have a common framework, scope and currency (i.e. biomass, energy); and the lack of knowledge on species acclimation and adaptation.

Overall, two consensus messages emerged from the workshops:

1. There is a need for improvement in communication and transfer of knowledge among the scientific community and between scientists, managers and interested parties; and
2. Scientists need to be realistic on what these types of models can provide, and a large effort should be dedicated to make the methods as transparent and documented as possible, as well as to provide tools to assess the quality of the models for the desired objectives (a map of existing models can be found in figure 3).

The next steps, agreed by participants, include: the development of a discussion paper on the future of these models and a proposed scientific forum to discuss the development of integrated ecosystem models.

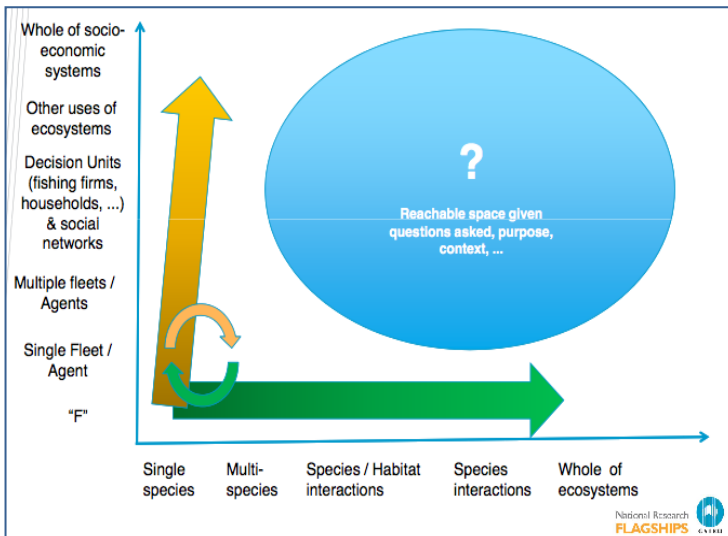


Figure 2: Target objectives of integrated models; incorporate both multispecies and complex socioeconomic relationships, together with climate and environmental drivers (Source: O. Thebaud and B. Fulton in WKIEM).

Figure 3: Map of existing models in the Mediterranean and Baltic Sea regions (Source: K. Tsagarakis, pers. com.).

Integrated versus end-to-end models

Integrated models that include a representation of all potential drivers in an ecosystem, from climate to the various compartments of the food web to humans, are often known as end-to-end models. It is however important to define the limits (both ends) of an end-to-end model definition.



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MariFish brings together the major funders of marine fisheries research in Europe and aims to strengthen links between marine fisheries science and fisheries management across Europe. Find out more about this study and MariFish at www.MariFish.net

